CLAIMS

1. A waveguide-semiconductor coupling device comprising:

a waveguide structure that includes a multimode interferometer (MMI) structure so as to minimize the reflections of TE modes in said coupling device; and

a mesa structure that is coupled to said waveguide structure so as to minimize the reflections of TM modes in said coupling device.

2. The waveguide-semiconductor coupling device of claim 1, wherein said mesa structure comprises Ge.

3. The waveguide-semiconductor coupling device of claim 2, wherein said mesa is coupled to a detector.

4. The waveguide-semiconductor coupling device of claim 3, wherein said detector comprises Ge.

5. The waveguide-semiconductor coupling device of claim 1, wherein said waveguide structure includes a polarization rotator.

6. The waveguide-semiconductor coupling device of claim 1, wherein said mesa structure is tapered.

7. The waveguide-semiconductor coupling device of claim 3, wherein said waveguide structure and said mesa structure are coupled at Brewster angles of the TM modes.

8. The waveguide-semiconductor coupling device of claim 7, where said Brewster angles are defined as $\tan^{-1}(n_D/n_{WG})$, where n_D is the index of refraction of the Ge detector and n_{WG} is the index of the waveguide structure.

9. A method of forming a waveguide-semiconductor coupling device comprising:

forming a waveguide structure that includes a multimode interferometer (MMI) structure so as to minimize the reflections of TE modes in said coupling device; and

forming a mesa structure that is coupled to said waveguide structure so as to minimize the reflections of TM modes in said coupling device.

10. The method of claim 9, wherein said mesa structure comprises Ge.

11. The method of claim 10, wherein said mesa is coupled to a detector.

12. The method of claim 11, wherein said detector comprises Ge.

13. The method of claim 9, wherein said waveguide structure includes a polarization rotator.

14. The method of claim 9, wherein said mesa structure is tapered.

15. The method of claim 11, wherein said waveguide structure and said mesa structure are coupled at Brewster angles of the TM modes.

16. The method of claim 15, where said Brewster angles are defined as $\tan^{-1}(n_D/n_{WG})$, where n_D is the index of refraction of the Ge detector and n_{WG} is the index of the waveguide structure.